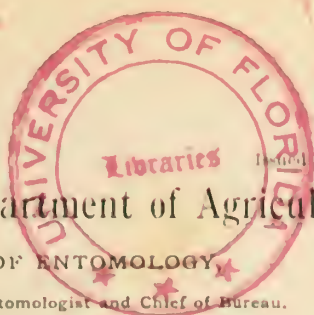


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THE EUONYMUS SCALE.

(*Chionaspis euonymi* Comstock.)^a

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INTRODUCTION.

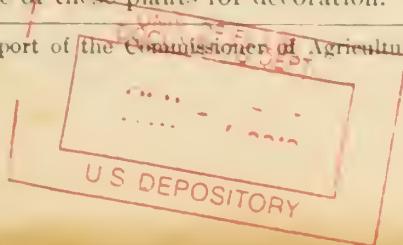
The most serious enemy of the various species and varieties of Euonymus in the eastern United States is commonly known as the Euonymus scale. The injuries occasioned by the attacks of this pest



FIG. 1.—A twig of Euonymus moderately infested with Euonymus scale. (Original.)

almost preclude the growing of these beautiful plants for hedges and borders, while the dire experiences of some gardeners have caused them to abandon entirely the use of these plants for decoration.

^a First described in the Annual Report of the Commissioner of Agriculture for 1880, p. 313 (1881).



The attacks of this scale insect are almost exclusively confined to *Euonymus*, although it has been found infesting the common wild bittersweet (*Celastrus scandens*), especially when growing in proximity to infested *Euonymus*. The native wild species of the latter plant and the introduced and horticultural varieties seem to suffer to the same extent from the attack of their common pest, and it is no uncommon sight to see plants of our wild species dying in the open forests and woodlands.

In 1886 Lichtenstein reported that at Montpellier, France, this scale was so destructive to *Euonymus* that it rendered the cultivation of that plant almost impossible; and more recently from Japan come reports of serious injury to *Euonymus japonica*.

HOST PLANTS.

This insect was first brought to the attention of the scientific world in the Agricultural Report for 1880 by Prof. J. H. Comstock, then U. S. Entomologist, who reported that it had destroyed nearly all the plants of *Euonymus latifolia* in Norfolk, Va. There are records of its injury to *Euonymus japonica*, *E. europæus*, *E. radicans*, *E. atropurpureus*, variegated and other horticultural varieties of *Euonymus*, and *Celastrus scandens* (bittersweet).

DISTRIBUTION.

Records are at hand of the occurrence of this scale in the following States, and it no doubt occurs in many others: Massachusetts, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Ohio, and California. It is also reported from France, Italy, and Japan.

DESCRIPTION.

This scale is exceedingly prolific. A plant which becomes infested is soon so completely covered that the attack results in its early destruction. There are at least two broods each season, and a probable third one in the Southern States.

A badly infested plant appears as if covered with snow, this condition being due to the presence of the enormous number of the pure white male scales, which are more conspicuous than the brown female scales. The photograph (fig. 1) of a moderately infested twig of variegated *Euonymus* conveys an idea of the general appearance of this scale. Note the comparatively few, elongate-oval, brown female scales as contrasted with the great number of the narrow, white, tricarinate scales of the males.

As in all the scale insects of this class, the female *Euonymus* scale is permanently fixed to one location except for a few hours or days in

the first larval stage, when it appears as a tiny yellow object with six legs which are atrophied before it reaches the adult stage. The male and female larvae are similar in the first stage, but later the male acquires a pair of delicate wings and emerges from its scale covering a free insect which never feeds, since its mouth-parts are replaced by extra pairs of eyes.

The following short technical description with accompanying illustration (fig. 2) is appended for entomologists or persons who have access to a compound microscope:

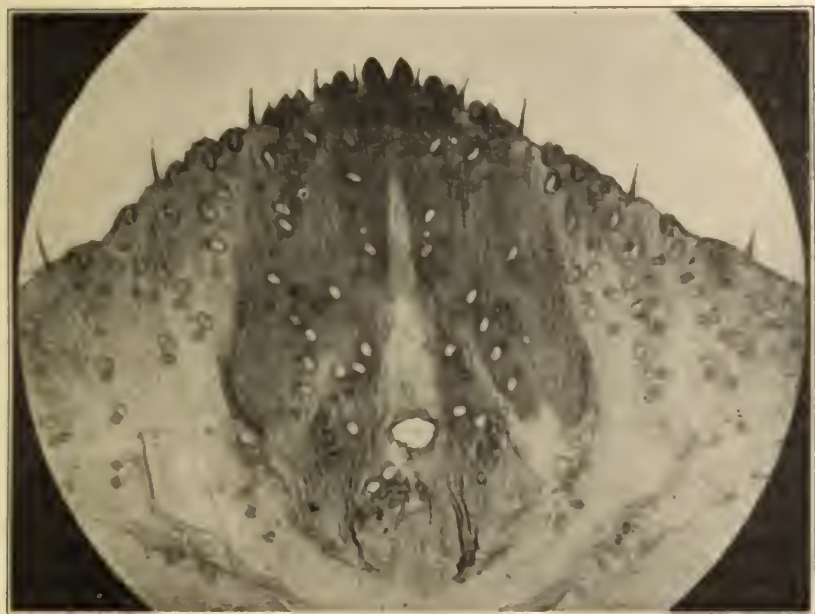


FIG. 2.—Photomicrograph of pygidium of adult female *Euonymus* scale (*Chionaspis euonymi*). (Original).

Scale of female.—Dark brown, with yellow exuvia, of heavy texture, convex, broader posteriorly. Length, 1.75 to 2 mm. Ventral scale white, completely developed, attached to upper scale along the sides but free posteriorly.

Scale of male.—Pure white, parallel sided, strongly tricarinated, with yellow exuvia. Length, 1 to 1.25 mm.

Female.—Broadest at fifth segment and tapering anteriorly and posteriorly. Median lobes and lobules of second and third lobes serrulate and pointed, widely separated; lobules of second and third lobes parted to the base, the inner always the larger. Gland spines comparatively short. Five groups of paragenital pores; median, 4-6; anterior lateral, 5-9; posterior lateral, 3-4.

REMEDIES.

For the control of this pest two distinct treatments are available, viz. summer and winter treatment, each having advantages and disadvantages. Arsenical poisons (Paris green, etc.) are of no avail in
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combating scale insects which suck the juices of plants; instead, a corrosive or oily contact insecticide is necessarily used.

SUMMER TREATMENT.

All scale insects are protected by waxy coverings of different kinds, except in the young larval stage, in which stage they are most easily destroyed by insecticides. The most effective treatment which is least injurious to the plant is the use of kerosene emulsion sprayed with some force on all parts of an infested plant at the time of the hatching of the young, using special care to cover thoroughly both sides of all leaves and twigs. The time of first hatching of the young varies with the seasons and latitudes, and extends from the first of May to the middle of June in different localities. Where no frost occurs the dormant season is very short. Repeated thorough sprayings of infested plants at intervals of two weeks between the above dates should effectively control this scale. Emulsion stronger than 15 per cent of oil should not be used on plants during the summer, else the foliage might suffer.

WINTER TREATMENT.

During the winter season plants are dormant and are able to withstand stronger insecticides without injury. The deciduous species of *Euonymus* should be treated after the falling of the leaves, or during winter, with a 25 per cent kerosene emulsion, or a solution of whale-oil soap at the rate of 1 pound to a gallon of water. The evergreen species and varieties can withstand 20 per cent kerosene emulsion during the dormant season. Care should be used to prevent the collection of the oily emulsion at the base of a treated plant, else injury may result.

Directions for the preparation of kerosene emulsion and the proportions of the ingredients are given below:

KEROSENE EMULSION.

Stock solution (66 per cent oil).

Kerosene (coal-oil, lamp-oil).....	gallons..	2
Whale-oil or laundry soap (or 1 quart soft soap).....	pound..	$\frac{1}{2}$
Water	gallon..	1

Dissolve the soap in boiling water, *then remove from the fire*, add the kerosene immediately, and thoroughly agitate the mixture until a creamy solution is obtained. This can be done by pouring the mixture into the tank of a spray-pump and pumping the liquid through the nozzle back into the tank. This is a stock solution which must be diluted before using. In order to make a 20 per cent emulsion, add to each gallon of the stock solution about $2\frac{1}{3}$ gallons of water and agitate thoroughly before using. For a 25 per cent solution add to each gallon of the stock solution $1\frac{2}{3}$ gallons of water and agitate thoroughly. This

strength will kill a large percentage of the hibernating females without injury to the plants.

If a good naphtha soap can be obtained the preparation of the emulsion will be simplified. It will be unnecessary to heat the solution, since the kerosene will combine readily with the naphtha and soap and form a perfect, cold, milky-white emulsion when the mixture is thoroughly agitated. If naphtha soap is used, double the amount called for by the formula, and emulsify in soft (rain) water.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *October 11, 1909.*

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